Making Games, Making Literacy: A Case-Study in Formal Educational Contexts

Carla Sousa[1], Daniel Cardoso[1,2], Conceição Costa[1] and Kathleen Tyner[3]
[1]CICANT - Lusófona University, Lisbon, Portugal
[2]FCSH - NOVA University, Lisbon, Portugal
[3]University of Texas at Austin, USA
carla.patricia.sousa@ulusofona.pt
danielscardoso@gmail.com
conceicao.costa@ulusofona.pt
ktyner@utexas.edu

Abstract: This paper aims to discuss the challenges of implementing a game-creation learning strategy to approach Media and Information Literacy (MIL), by reflecting on how different affordances and constraints, such as classroom's design, setting and the adopted pedagogical strategies impact the learning process. We also contribute to a critical stance on game-creation in the learning environment, by reflecting on the lessons learned and the strategies deployed to deal with unforeseen events while working with students and gathering data. This will allow us, to refine and complexify the practices surrounding this pedagogical tool. This proposal is framed on GamiLearning (2015-2018), a research project that aims to promote critical and participative dimensions of MIL in children through the creation of digital games. The project argues that the process of creation and development of videogames can help the promotion of MIL, in particular operational, editorial, organizational, and digital identity management skills. The present paper focuses on the project's fieldwork, developed in three different schools in Greater Lisbon, Portugal, with fifth-graders, aged 9 to 12. The data was gathered using observation, and an observation grid, specifically developed for the project, was filled out for each session, considering the following categories: MIL Skills, student's behaviors and beliefs, pedagogical strategies and difficulties. The data were subjected to content analysis with the help of NVivo 11, with several researchers from the team involved in creating a coding scheme that could be deployed in other MIL projects around game creation activities. The main difficulties felt by students were related to the usage of Scratch to create their own animation stories or to remix existing games, although these were also the most engaging tasks. The main pedagogical strategy used to approach game creation was project-based learning, and the main constraints are related with access issues in schools, mainly with the wi-fi network, and with the user interface usability of the used platforms. These observations aim to document game creation by students not only as a hands-on approach to the development of MIL but also as a pedagogical tool across the curriculum.

Keywords: game creation, game-based learning, media and information literacy, children, pedagogical strategies

1. Introduction

Media and information Literacy (MIL) is central in a highly mediatized society. It enables students to understand how the media operate, how they construct meaning, how they can be used, and how to evaluate information. Nowadays, MIL is increasingly seen as requiring a wide set of competences. MIL in this study is conceptualised as a construct that includes: operational skills (including coding and computing), editorial skills (including multimedia writing-reading-producing and mixing) and organisational skills (including navigating, sorting, filtering, evaluating) (Frau-Meigs, 2014); a more sociocultural component, implying that people don't create meanings individually, but as members of "interpretive communities" (Livingstone et al., 2013); and digital identity management skills, relevant to reflect the ability of individuals manage their e-presence in a safe and sustained manner (Costa et al., 2017).

As a complex construct MIL requires a seamless and transversal praxis, framed in the multifaceted aspects of life and power in the 21st century and crucial for identifying liberatory pathways for a democratic citizenship in the digital age (Garcia, Seglem and Share, 2013). The promotion of MIL is known to require the immersion of students in the process, namely in an environment that allows experimentation of different roles, and evokes a critical dimension of knowledge based on the question "What did I learn about media through this exercise?" (Tuominen and Kotilainen, 2012, p. 17). It is also known that the promotion of literacy, in a broad spectrum, highly depends on the use of symbolic representation and experimentation that play promotes and allows (Roskos and Christie, 2001).

Play is nowadays seen as a central aspect in childhood. It provides the necessary "field of experience" through which subjects develop their own identities (Farné, 2005) promoting: brain development and new neural

connections; the development of a sense of morality; emotional flexibility; self esteem; attention; attachment to the so called playful activity (Goldstein, 2012); and literacy (Roskos and Christie, 2001). The concept of play is broad and can't be limited to a singular behavior. Further, it is defined as any activity undertaken with a playful frame of mind and, above all, intrinsically motivated (Farné, 2005). The intrinsic motivation and intentionality aspects are central to Play (Farné, 2005) and also central to literacy development (Roskos and Christie, 2001). This premise frames a set of pedagogical practices known as pedagogies of play, mainly based on the idea that children are able to construct conceptual knowledge through Play (Edwards and Cutter-Mackenzie, 2013).

There are several types of pedagogical strategies that adopt a more playful frame, where students are oriented for specific goals or for the solution of problems and mainly promote intrinsic motivation, highlighting the intentionality of the activities. Usually, their main idea is that each subject can build his own knowledge. This idea emerged with constructionism, a theory of education developed by Seymour Papert, Idit Harel and colleagues at the MIT Media Lab as a framework for learning and educative action (Reynolds and Caperton, 2011). This view is based on the idea that learners construct new knowledge based upon their prior experience and personal interpretation of the world (Piaget, 1971). Constructionist interventions mainly follow a project-based design, to engage students in technology programming activities by encouraging them to build computational artifacts as a representation of original ideas, like digital games (Reynolds and Caperton, 2011).

Therefore, the individual learning process is seen as more effective if the subjects are engaged in knowledge construction than if subjects are positioned as mere passive information receptors (Cheng, 2009). Project-Based Learning (PBL), for example, emerges of this student-centered pedagogical premise, using the investigation of solutions to "real" problems (Blumenfeld, et al., 1991) as a trigger for students to construct their own learning (Lee, et al., 2014). Another relevant concept for understanding the pedagogies that incorporate the concept of Play is Experiential Learning, or the idea that students learn, not only by experimenting, but also by reflecting about their experiences. In this strategy, reflection can be less or more guided by the teacher, and helps the student in gaining insight into themselves and their interactions with the world (Kolb, 1984).

1.1 Games and learning

As discussed above, Play is seen as a key aspect in children's development, including in the promotion of literacies (Roskos and Christie, 2001). Games and play are intrinsically connected, this allowed the exploration of the connection between games and learning over the years. Concepts like flow and immersion, are directly implied in this connection, specifically when studying videogames, by arguing that the complete absorption of the subject in the virtual environment promotes engagement in a goal-driven activity, like playing a game (Annetta, 2010). Game-based Learning (GBL) emerges from the understanding of playing games as a valuable and effective learning experience. Its effectiveness has been extensively documented in research for the learning of the most diverse type of contents and competences (Sousa and Costa, in press), but also in the development of mechanisms that facilitate the learning process, frequently know as "learning how to learn" (Ashinoff, 2014).

When framing the idea of games as a pedagogical tool in the above explained theories, such as constructionism, PBL and experiential learning, another important strategy emerges; the idea that subjects can learn through playing games but also through creating games. Delwiche (2010) highlights the factors that facilitate the relationship between game play, game creation and learning: immersion, engagement, identification, and interactivity. When creating games, students work independently, researching information about the subject matter that can be modeled in a game, constantly reflecting about their own learning processes. This premise can easily be framed in the goal orientation argued by PBL, and in the central role of reflection argued by experiential learning. Videogame creation has been increasingly seen as a promoter of powerful learning environments, where students construct their own knowledge, collaborating with peers and allowing teachers to have a role more as a facilitator than as an instructor (Madill and Sanford, 2007).

The promotion of MIL is known to require the immersion of students in the process, namely in an environment that allows experimentation of different roles, and evokes a critical dimension of knowledge based on the question "What did I learn about media through this exercise?" (Tuominen and Kotilainen, 2012, p. 17).

Considering such characteristics, instructional pedagogical approaches can be seen as insufficient to effectively promote MIL. Game creation provides an experimentation environment and frames the required reflexive component relevant for MIL development. Therefore it is no surprise that game-based learning is already

considered an emerging trend in the promotion of MIL, mainly based on its ability to improve learner's motivation and engagement (Costa, Car and Papadimitriou, 2017, p. 259).

1.2 Affordances and constraints

One of the major barriers to the implementation of this type of pedagogies in contemporary classrooms is the continued dominance of essentialist educational practices. Essentialist education is a conservative educational theory from the early 20th Century promoted by William C. Bagley (1905) in direct contrast to the progressive, constructivist theories of John Dewey (1910) and Lev Vygotsky (1978). The essentialist education theory marginalizes the individual interests of students and instead focuses on the role of experts who efficiently teach the same disciplinary and practical subject matter for all students (Bagley, 1905). These essentialist practices can also be seen in the design of the learning spaces. For example, the traditional rows of tables where students work, don't provide opportunities for collaboration, expertise sharing and, above all, constraint the development of collective knowledge. As supported by Madill and Sanford (2007), the adoption of pedagogical strategies requiring the usage of new technologies must be accompanied by profound changes in the shape of the physical learning spaces.

The present article reflects on the findings of GamiLearning (2015-2018), an action-research project that implemented an educational intervention based on game creation as a strategy to promote MIL.

GamiLearning adopted a mixed-method approach, to transcend the quantitative-qualitative debate, as mutually exclusive approaches, and alone insufficient for the study of a reality as complex as the educational context (Salomon, 1991; Coutinho, 2015). Though the quantitative results sustain the effectiveness of the game creation based approach to the promotion of MIL, by reporting statistically significant differences between pre and post intervention assessments (Costa et al.,2018), triangulation with qualitative data is required to comprehend the specificities and the complexity of this phenomenon.

The aim of this specific paper is to discuss the challenges of implementing a game-creation learning strategy to approach MIL, and reflecting on how different affordances and constraints, such as classroom's design, setting and adopted pedagogical strategies impact the learning process.

2. Method

2.1 Participants and schools

The present study is an exploratory multi-case study with three schools located in Lisbon, with students aged 9-12, enrolled in the fifth grade of Basic Education. School 1 is a private school located in a business district of Lisbon. It bases its pedagogy on innovation, mainly framed as arts education, but also with an emphasis on sports activities and digital literacy. School 2 is a private school located in a historic area of Lisbon. It bases its teaching methods on the promotion of excellence, citizenship, and encourages community-based partnerships for student projects. School 3 is a public school, located in Lisbon surroundings and classified as an educational territory of priority intervention, by the Portuguese Ministry of Education. This classification is used to highlight the need for urgent intervention to reverse drop-out trends and create a supportive environment for learning in a low-performing school with high needs (Ministério da Educação e Ciência, 2012).

The sampling selection was based on the convenience and availability of the schools to participate in the study. All schools and parents signed confidentiality and informed consent agreements. The final sample was composed by 45 students, 62,2% male (N = 28) and 37,8% Female (N = 17), aged between 9 and 12 years old (*M* = 9,98; *SD* = 0.583). Detailed sample characterization can be found in Table 1.

Table 1: Sample characterization, by age and gender

	Age	**Gender**	
		Male	Female
Total Sample (N = 45)	*M* = 9,98 *SD* = 0.583	28	17

	Age	Gender	
		Male	Female
School 1 (N = 20)	*M* = 9,70 *SD* = 0,470	10	10
School 2 (N = 6)	*M* = 10,00 *SD* = 0,000	6	0
School 3 (N = 19)	*M* = 10,26 *SD* = 0,653	12	7

2.2 Procedure

The GamiLearning intervention was carried out once per week in the participant schools. The duration of each session ranged between 45 and 90 minutes. To ensure similar total times for each school, the intervention ranged between one school period (approximately four months) to an entire school year (from October to June), with a mean of 30 hours per school (School 1 = 33; School 2 = 28; School 3 =29). During the GamiLearning classes several activities were carried out, aiming to promote MIL, with a specific emphasis in Digital Identity Management Skills. For such purpose, different pedagogical strategies were adopted, in the majority based in the above defined pedagogies of play, from now on referred to as playful activities. The list of the developed playful activities and descriptions can be found in Table 2.

Table 2: GamiLearning's playful activities and descriptions

Activity	Description
Animated Stories creation using Scratch	Students created a storyboard analogically and then reproduced it in Scratch. The theme was freely chosen by the students.
Game remix using Scratch	Based on a game created by the teacher about digital security, the students created a game remix. Students were encouraged to change everything they want in the game, maintaining the same theme (digital security/digital identity management).
Algorithm Game	Students made an activity where a robot had to prepare a snack. In groups of two, they schematically wrote each step the robot had to take to prepare the snack. This activity aimed to stimulate the algorithmic thinking.
Caesar's Cipher Game	Using an analogic Caesar's cipher wheel, students were grouped in three teams. Two teams of messenger (emitters and receptors) and a group of intruders. The intruders' goal was to crack the message of the emitters, before they are able to share it with the receptors.

Every project session had the presence of a researcher, carrying out a participant observation procedure, through the filling of the developed observation grids.

2.3 Data collection and analysis

The observation grid was specifically developed for GamiLearning sessions, along with standard filling instructions for all the observers, to reduce any possible biases. The sections' grids were: activities; adequation to student's language level (difficulties vs autonomy); behavioral observation; content apprehension/content production; and other aspects/observations. Filling instructions for each section can be found in Table 3.

Table 3: Observation grids' sections and filling instructions for observers

Section	Instruction
Activities	This field should include the name or designation of the activity (as stipulated in the GamiLearning curricula) and, if necessary, a brief description. It should be stated the amount of time for the activity (in minutes).
Adequation to student's language level (difficulties vs autonomy)	This field shall contain any comments about difficulties (or autonomy) noticed in students when executing or understanding the requirements of the described activity.
Behavioral observation	This field should include verbal and non-verbal language aspects of the students, related to the activity. Aspects related to behavior per se may be included, but also aspects related to engagement with the activity, and the relationship between both.
Content apprehension/content production	This field should include aspects of how students learned principles and content underlying the session and how they have been able to produce their own content, considering what has been learned.
Other aspects/observations	All relevant observations, which are not covered by the above sections, should be registered in this section.

The content analysis of the 58 observation grids was performed using NVIVO version 11, and based on a coding created for this effect. This coding guide resulted of an iterative creation process, with a double strand, both bottom-up, resulting from the non-systematic reading of all the grids, and top-down, based on the above defined theoretical framework, that conjugates insights from Frau-Meigs (2014), Livingstone et al. (2013) and Costa et al. (2017). The used codings and subcodings are explained in Table 4.

Table 4: Coding developed for the observation grids

1. Activity/Theme	3.1. Engagement
1.2. Animated stories creation using Scratch	3.2. Student Disattention
1.3. Game remix using Scratch	3.3. Peer Cooperation
1.4. Scales and surveys filling	3.4. Student-Teacher Interaction
1.5. Presentation of the students' projects	4. MIL Skills
1.6. Algorithm Game	4.1. Operational Skills
1.7. Avatar Creation	4.2. Editorial Skills
1.8. Pirates	4.3. Organisational Skills
1.9. Internet	4.4. Digital Identity Management Skills
1.10. Caesar's Cipher	5. Pedagogical Strategies
1.11. Reflections and discussions about digital security	5.1. Project-Based Learning
1.12. Usage of SAPO Campus	5.2. Guided Reflection
2. Comprehension/Adequation of the proposed activities	5.3. Expository Lecture
2.1. Autonomous performing of the task	6. Classroom affordances and Constraints

2.2. Difficulties in the task	6.1. Design of the Learning Space
3. Behavioral observation	6.2. Access issues

3. Results

The results presented here pertain to the prevalence of observed behaviours during the sessions, and also observations about the physical affordances of the classrooms and the technology therein.

There are clear differences between MIL skills' deployment in varied tasks. Within the total amount of observed activities, gaming remix and story creation using Scratch were the ones more connected to editorial skills (32% and 59% of these skills, respectively), the algorithm game required mostly operational skills (32% of the codings pertaining to this skill). Several activities, such as coding to Snack or creating avatars mostly didn't require the use of any MIL skills; on the other hand, using Scratch was the most MIL-intensive activity, with 30 instances of MIL skills being used by students.

Analysing the reports on the efficacy of the deployment of MIL skills also gives us a clear understanding of what were the main difficulties for students. Digital identity management skills were the ones where students demonstrated more autonomy (71% of the observations), followed by editorial skills (59% of the observations) and operational skills (54% of the observations). On the other hand, organizational skills were only seldom used, and even so those few times represented a challenge for students.

Different pedagogical strategies were employed - lecturing, guided reflection and project based learning. From the results, we can see that these strategies don't operate uniformly in regards to all skills. Organizational skills, though a part of the project, seem to have had little investment from teachers, and were not observed being developed through any of the above strategies; editorial and operational skills were derived mainly through project-based learning (accounting for 69% and 88%, respectively), while digital identity management was encouraged mainly via guided reflection (77% of the codings regarding this skill). In all cases, expository lecturing was not observed as being very relevant, comparatively, to developing MIL skills; other strategies - such as peer critique or teacher assessment - did not correlate to any MIL skill development.

Engagement was highest, as above, with activities around digital identity management. It was peer cooperation that was the most transversal in terms of how many different skills were involved, since it encompassed all of them, whereas student-teacher interaction showed, according to the coding done, the least amount of MIL skills display, with only two of the four skills being involved (digital identity management and editorial skills).

Problems regarding the design of the learning space were also very frequent. Because of the lack of computers, each desktop computer had to be shared by two or more students. Moreover, all of the computers were desktops, frequently located near the wall, not allowing the students to look at the screen and the teacher simultaneously. For instance, if a student was using Scratch and wanted to interact with the teacher, they had to stop and turn the chair to do it. The rooms were small and full of tables, not allowing significant changes in furniture and/or computer disposition. The learning spaces also had access issues, mainly related with the frequent unavailability of the wi-fi network.

Issues related with the usability of the platforms were also relevant, mainly having to do with the login process. Since the students were very young, most of them did not have personal email accounts, and processes like the account confirmation or password recovery depended on parents' email accounts. The impossibility of accessing Scratch during a game creation session because of these issues generated situations of expressed frustration by students, and significantly affected the sessions' timings and aims.

4. Discussion

The present study aimed to reflect on game creation as a strategy to promote MIL, approaching different affordances and constraints, such as classroom's design, setting and adopted pedagogical strategies, and their impact in the learning process. The results highlight the promotion of operational and editorial skills as being the most notable outcome of this game-creation intervention, which can frame the discussion about the interconnection of these two skills in the media creation process. Organizational skills are only marginally

promoted within the project sessions, in agreement with the smallest focus given to this in the developed curricula.

PBL was the most adopted pedagogical strategy to approach the promotion of editorial and operational skills, which reinforces game creation as a student-centered initiative, one that requires a wide set of skills to solve a complex problem or create a complex output. Guided reflection were the most frequent approaches to the development of digital identity management skills, highlighting the critical and analytical extent of a responsible online presence, as well as the relevance of experiential learning as a framework to develop MIL skills. Digital identity management skills promotion was the most engaging for children, which can be interpreted by considering the gamified manner through which some knowledge in the field was presented to the students (for example, cryptography with Caesar's cipher wheel). Editorial skills were also found to be the ones that most frequently promote social interaction, reinforcing the collaboration and cooperation required in the process of game creation.

As can be seen from the results, most of the tools and strategies deployed engaged only with a small amount of MIL Skills simultaneously - with the due exception of Scratch usage. An implication of this is that authoring tools like Scratch that allow to develop skills (editorial and operational skills, for instance) in an interconnected way contribute more to a critical stance on how to engage with literacy and media.

These findings highlight the need to include Experiential Learning premises in game creation strategies to promote literacy, meaning that the promotion of MIL depends not only on the use of certain tools, but also in the critical reflections about these use.

The different pedagogies employed in this project allowed for more flexible classroom practices, but the developed curricula might also have contributed to de-emphasizing some MIL skills, such as organisational skills. This also raises questions about how much the students' prior knowledge was fundamental for shaping the way the learning process occurred, by facilitating some activities and making others more difficult.

Different modes of interaction seem to be associated with engagement in different skills and practices. This highlights the importance of adapting the pedagogic tools to the conceptual objectives and to the epistemic presuppositions of those tools. Therefore, the strategies for student engagement need to be aligned with the position of the teacher in regards to the materials and the tools used.

The constraints found related with the design of the learning space are aligned with previous studies (Madill and Sanford, 2007) and frame the premise that the change of pedagogical approaches must be accompanied by changes on the physical space, to better incorporate innovation. For example, having desktop computers on a classroom does not allow the required flexible configuration of the learning space. It is not feasible to reconfigure tables with computers during class or even between classes, the best option being to have portables. The current classroom configuration seems opposite to the successful adoption of game creation pedagogies, since even in a digital game creation class computers are not desirable all the time and the teacher must be able to interact with the students. Having portable computers, for example, could be a better approach, but it does not represent the actual reality of Portuguese schools.

Access issues are also an important constraint to reflect when planning digital game-creation pedagogical intervention. The availability of computers and internet access can affect the learning process, and highly depends on each school's socioeconomic context, being a variable difficult to control. Further research on the user interfaces and their usability in children platforms, such as Scratch, could also clarify some difficulties registered in the intervention.

Considering these results, digital game creation can be understood as a relevant pedagogical strategy, not only in the promotion of MIL skills but in literacy development in general. First of all, critical media literacy requires the development of reflexive knowledge: a child needs to know a topic very well to be able to produce a related game. Secondly, in the process of game creation, children engage in collaboration and peer-learning, which has been shown to support critical literacy and learning across the curriculum. Third, game design and content creation also provides children with opportunities to integrate and reflect on their everyday media experience. Thereby, digital game creation can be seen as a goal-driven and student centered pedagogy, to empower

students in constructing their knowledge in a collaborative environment, both between peers and between students and teachers.

Acknowledgements

The present study was conducted under GamiLearning Project (UTAP-ICDT/IVC- ESCT/0020/2014), funded by the Portuguese Foundation for Science and Technology (FCT), within the UT Austin|Portugal Program.

References

Annetta, L. (2010). The "I's" have it: A framework for serious educational game design. *Review of General Psychology*, 14(2), pp.105-112.

Ashinoff, B. (2014). The potential of video games as a pedagogical tool. *Frontiers in Psychology*, 5.

Bagley, W. C. (1905). *The Educative Process*. New York, USA: Macmillan.

Blumenfeld, P., Soloway, E., Marx, R., Krajcik, J., Guzdial, M. and Palincsar, A. (1991). Motivating Project-Based Learning: Sustaining the Doing, Supporting the Learning. *Educational Psychologist*, 26(3), pp.369-398.

Cheng, G. (2009). Using game making pedagogy to facilitate student learning of interactive multimedia. *Australasian Journal of Educational Technology*, 25(2), pp.204-220.

Costa, C., Car, V. and Papadimitriou, S. (2017). Good practices and emerging trends in media and information literacy. In: D. Frau-Meigs, I. Velez and J. Michel, ed., *Public Policies in Media and Information Literacy in Europe: cross-country comparisons*. New York, USA: Routledge, pp.227-268.

Costa, C., Sousa, C., Rogado, J. and Henriques, S. (2017). Playing Digital Security. *International Journal of Game-Based Learning*, 7(3), pp. 11-25.

Costa, C., Tyner, K., Henriques, S. and Sousa, C. (2018). Game Creation in Youth Media and Information Literacy Education. *International Journal of Game-Based Learning*, 8(2), pp.1-13.

Coutinho, C. (2015). *Metodologia de investigação em ciências sociais e humanas* (2nd ed.). Coimbra, Portugal: Almedina.

Delwiche, A. (2010). Media literacy 2.0: Critically Analyzing the Unique Characteristics of Video Games. In K. Tyner, ed., *New Agendas for Media Literacy*. New York, USA: Routledge, pp. 175-191.

Dewey, J. (1910). *How We Think*. Boston, USA: D.C. Health.

Edwards, S. and Cutter-Mackenzie, A. (2013). Pedagogical Play Types: What Do They Suggest for Learning About Sustainability in Early Childhood Education?. *International Journal of Early Childhood*, 45(3), pp.327-346.

Farné, R. (2005). Pedagogy of Play. *Topoi*, 24(2), pp.169-181.

Frau-Meigs, D. (2014). Media and Information Literacy (MIL): how can MIL harness the affordances of digital information cultures post-2015? Geneva: WSIS Action Line C9 report on Media and Information Literacy.

Garcia, A., Seglem, R. and Share, J. (2013). Transforming Teaching and Learning Through Critical Media Literacy Pedagogy. *LEARNing Landscapes*, 6(2), pp. 109-124.

Goldstein, J. (2018). *Play in Children's Development, Health and Well-Being*. Brussels, Belgium: Toy Industries of Europe.

Kolb, D. (1984). *Experiential learning*. Englewood Cliffs, New Jersey: Prentice-Hall

Lee, J., Blackwell, S., Drake, J. and Moran, K. (2014). Taking a Leap of Faith: Redefining Teaching and Learning in Higher Education Through Project-Based Learning. *Interdisciplinary Journal of Problem-Based Learning*, 8(2).

Livingstone, S., Bulger, M. and Zaborowski, R. (2013). Media literacy research and policy in Europe. COST Action, Transforming Audiences, Transforming Societies. Brussels, Belgium: COST.

Livingstone, S., Wijnen, W., Papaioannou, T., Costa, C. and Grandio, M. (2013). Situating media literacy in the changing media ecology: critical insights from European research on audiences. In N. Carpentier, K. Shroeder and H. Hallet, eds., *Audience Transformations: Shifting Audience Positions in Late Modernity*. London, UK: Routledge.

Madill, L. and Sanford, K. (2007). Video-Game Creation as a Learning Experience for Teachers and Students. In: R. Ferdig, ed., *Handbook of Research on Effective Electronic Gaming in Education*. Hershey, PA, USA: IGI Global, pp.1257-1272.

Ministério da Educação e Ciência (2012). Retrieved 6 November 2017 from http://www.dge.mec.pt/sites/default/files/EPIPSE/despacho_normativo_20_2012.pdf.

Piaget, J. (1971). *Genetic epistemology*. New York, USA: W.W. Norton.

Reynolds R. and Caperton I. H. (2011). Contrasts in student engagement, meaning-making, dislikes, and challenges in a discovery-based program of game design learning. *Educational Technology Research and Development*, pp.267-289.

Roskos, K. and Christie, J. (2001). Examining the play-literacy interface: A critical review and future directions. *Journal of Early Childhood Literacy*, 1(1), pp. 59-89.

Salomon, G. (1991). Transcending the Qualitative-Quantitative Debate: The Analytic and Systemic Approaches to Educational Research. *Educational Researcher*, 20(6), 10.

Sousa, C. and Costa, C. (in press). Videogames as a Learning Tool: Measuring the efficacy of Game-Based Learning Interventions. *Revista Lusófona de Educação*.

Tuominen, S. and Kotilainen, S. (2012). *Pedagogies of Media and Information Literacies*. Moscow, Russia: UNESCO.

Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, USA: Harvard University Press.